

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

an arranging system capable of arranging said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein when said input speech is voiced, said random code vector comprises a plurality of pulses, and when said input speech is unvoiced, said random code vector comprises said one or more said fixed waveforms as arranged by said arranging system.

3. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

an arranging system capable of arranging said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein said random codebook is capable of generating different random code vectors based on the results of said determiner;

wherein said different random code vectors are generated by arranging different fixed waveforms in said arranging system.

4. A code excited linear prediction speech decoder, comprising:
- an adaptive codebook capable of generating an adaptive code vector;
 - a random codebook capable of generating a random code vector;
 - a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;
 - said random codebook comprising:
 - an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;
 - a fixed waveform storage system capable of storing one or more fixed waveforms; and
 - an arranging system capable of arranging said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;
 - a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein when said input speech is voiced, said random code vector comprises a plurality of pulses, and when said input speech is unvoiced, said random code vector comprises said input vector as modified by said one or more said fixed waveforms.

5. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

an arranging system capable of arranging said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein said random codebook is capable of generating different random code vectors based on the results of said determiner;

wherein said different random code vectors are generated by using different fixed waveforms in the modification of said input vector.

6. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a shifting system capable of shifting said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;

Al Gmt.
a determiner that determines whether input speech is at least one of voiced and unvoiced; and

B
wherein, when said input speech is voiced, said random code vector comprises a plurality of pulses, and when said input speech is unvoiced, said random code vector comprises at least said fixed waveforms as shifted by said shifting system.

7. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a shifting system capable of shifting said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;

AI
Gmt
b
a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein said random codebook generates different random code vectors based on the results of said determiner;

wherein said different random code vectors are generated by shifting different fixed waveforms in said shifting system.

8. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a shifting system capable of shifting said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein, when said input speech is voiced, said random code vector comprises a plurality of pulses, each pulse having a predetermined position and polarity, and when said input speech is unvoiced, said random code vector comprises said input vector as modified by said at least said one or more said fixed waveforms.

9. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a shifting system capable of shifting said fixed waveforms in accordance with the position and the polarity of said at least one pulse of said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein said random codebook is capable of generating different random code vectors based on the results of said determiner;

wherein said different random code vectors are generated by using different fixed waveforms in the modification of said input vector.

10. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a convolution system capable of convoluting said fixed waveforms with said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein, when said input speech is voiced, said random code vector comprises a plurality of pulses, and when said input speech is unvoiced, said random code vector comprises said one or more said fixed waveforms as convoluted by said convolution system.

11. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a convolution system capable of convoluting said fixed waveforms with said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein said random codebook is capable of generating different random code vectors based on the results of said determiner;

wherein said different random code vectors are generated by convoluting said fixed waveforms with said input vector in said convolution system.

12. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a convolution system capable of convoluting said fixed waveforms with said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein, when said input speech is voiced, said random code vector comprises a plurality of pulses, and when said input speech is unvoiced, said random code vector comprises said input vector as modified by said one or more said fixed waveforms.

13. A code excited linear prediction speech decoder, comprising:

an adaptive codebook capable of generating an adaptive code vector;

a random codebook capable of generating a random code vector;

a synthesis filter that receives a signal based on said adaptive code vector and said random code vector, and is capable of performing linear prediction coefficient synthesis on said signal;

said random codebook comprising:

an input vector providing system capable of providing an input vector comprising at least one pulse, each pulse having a predetermined position and a respective polarity;

a fixed waveform storage system capable of storing one or more fixed waveforms; and

a convolution system capable of convoluting said fixed waveforms with said input vector;

a determiner that determines whether input speech is at least one of voiced and unvoiced; and

wherein said random codebook is capable of generating different random code vectors based on the results of said determiner;

wherein said random code vectors are generated by using different fixed waveforms in the modification of said input vector.

14. A method of producing synthesized speech, said method comprising:
providing an adaptive code vector;
determining whether input speech is at least one of voiced and unvoiced;
providing an unvoiced random code vector if said input speech is unvoiced,
comprising:

providing an input vector comprising at least one pulse, each pulse having a position and a polarity;

storing one or more fixed waveforms; and
modifying said one or more fixed waveforms in accordance with the
polarity and the position of said at least one pulse of said at least one input vector;
providing an voiced random code vector if said speech is voiced, said voiced
random code vector including a plurality of pulses; and
performing linear prediction/coefficient synthesis on a signal based on said
adaptive code vector and one of said voiced random code vector and said unvoiced
random code vector.

15. The method of claim 14, wherein said modifying comprises one of arranging,
and shifting said at least one fixed waveform in accordance with the polarity and the
position of said at least one pulse of said at least one input vector.

16. A method for producing synthesized speech, comprising:
providing an adaptive code vector;
determining whether input speech is at least one of voiced and unvoiced;
providing a unvoiced random code vector if said input speech is unvoiced,
comprising:
providing a plurality of input vectors, each comprising a plurality of pulses,
each of said pulses having a position and a polarity;
providing a plurality of fixed waveforms;

modifying each of said plurality of fixed waveforms in accordance with a position a polarity of the plurality of the pulses of said plurality of input vectors, respectively; and

adding said modified fixed waveforms;

providing an voiced random code vector if said speech is voiced, said voiced random code vector including a plurality of pulses; and

performing linear prediction coefficient synthesis on a signal based on said adaptive code vector and one of said voiced random code vector and said unvoiced random code vector.

17. The method of claim 16, wherein said modifying comprises one of arranging and shifting said plurality of fixed waveforms in accordance with the position and the polarity of the plurality of the pulses of said plurality of input vectors, respectively.

18. A system for producing synthesized speech, comprising:

an adaptive code vector;

a random code vector generator capable of generating a random code vector, comprising:

an input vector providing system capable of providing a plurality of input vectors, each comprising a plurality of pulses, each of said pulses having a position and a polarity;

a fixed waveform storage system capable of storing a plurality of fixed waveforms; and

a modification system capable of modifying each of said plurality of fixed waveforms in accordance with a plurality and a position of said plurality of pulses of said plurality of input vectors, respectively;

an adder that adds each of said plurality of fixed waveforms as modified;

a determiner that determines whether input speech is at least one of voiced and unvoiced;

a synthesis filter capable of performing linear prediction coefficient synthesis on a signal based on said adaptive code vector and said random code vector;

wherein, when said input speech is voiced, said random code vector comprises a plurality of pulses, and when said input speech is unvoiced, said random code vector comprises said plurality of fixed waveforms as modified by said modification system and added by said adder.

19. The system of claim 18, wherein said modification system one of arranges and shifts said plurality of fixed waveforms in accordance with the position and the polarity of the plurality of the pulses of a different one of said plurality of input vectors, respectively.

20. A system for producing synthesized speech, comprising:

a plurality of input vectors, each comprising a plurality of pulses, each of said pulses having a position and a polarity;

P18663.A02

at least first and second sets of fixed waveforms;

a switch movable to a plurality of positions, each position being responsive to one of a plurality of conditions; and

a modification system;

wherein, when said switch is in a first position, an output of said system is at least partially a result from a modification of one of said first set of fixed waveforms in accordance with the polarity and the position of said plurality of pulses of a different one of said plurality of input vectors, as modified by said modification system; and

wherein, when said switch is in a second position, an output of said system is based at least partially upon said second set of fixed waveforms.

21. The system of claim 20, wherein said modification of said each fixed waveform of said first set of fixed waveforms comprises one of arranging and shifting said each fixed waveform of said first set of fixed waveforms in accordance with the polarity and the position of said plurality of pulses of a different one of said plurality of input vectors.

22. A method of providing an excitation vector used in the production of synthesized speech, said method comprising:

providing a plurality of input vectors, each comprising a plurality of pulses, each of said pulses having a position and a polarity;

providing first and second sets of fixed waveforms;

determining whether input speech is at least one of voiced and unvoiced;

outputting, if said input speech is unvoiced, a signal resulting from modifying one of said first set of fixed waveforms in accordance with the polarity and the position of the pulses of said plurality of input vectors, respectively;

outputting, if said input speech is voiced, a signal based at least partially on said second set of fixed waveforms.

23. The method of claim 22, wherein said modifying of each said fixed waveform of said first set of fixed waveforms comprises one of arranging and shifting each said fixed waveform of said first set of fixed waveforms in accordance with the polarity and the position of said plurality of pulses of a different one of said plurality of input vectors.

24. A method of producing synthesized speech, said method comprising:

providing an adaptive code vector;

determining whether input speech is at least one of voiced and unvoiced;

providing an unvoiced random code vector if said input speech is unvoiced,

comprising:

providing an input vector comprising at least one pulse, each pulse having a position and a polarity;

storing one or more fixed waveforms; and

convoluting said fixed waveforms with said input vector;

providing an voiced random code vector if said speech is voiced, said voiced random code vector including a plurality of pulses; and

performing linear prediction coefficient synthesis on a signal based on said adaptive code vector and one of said voiced random code vector and said unvoiced random code vector.

25. A system for producing synthesized speech, comprising:

an adaptive code vector,

a random code vector generator capable of generating a random code vector,

comprising:

an input vector providing system capable of providing a plurality of input vectors, each comprising a plurality of pulses, each of said pulses having a position and a polarity;

a fixed waveform storage system capable of storing a plurality of fixed waveforms; and

a convolution system capable of convoluting each of said plurality of fixed waveforms with one of said plurality of input vectors, respectively;

an adder that adds each of said plurality of fixed waveforms as modified;

a determiner that determines whether input speech is at least one of voiced and unvoiced;